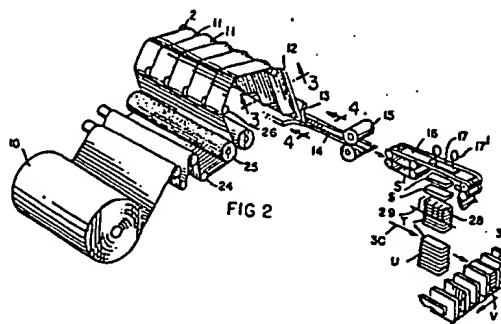


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(54) Method and apparatus for producing stacks of folded web material

(57) A method and apparatus for folding web material to produce packages of a converted product wherein a multiple width roll is unwound and slit to produce a plurality of webs, each web thereafter being first longitudinally V-folded and thereafter C-folded, the thus-folded webs thereafter being superposed and transversely pinch cut to produce substacks, the substacks being accumulated into a final stack for each package of the converted product.



GB 2 028 774 A

1/2

FIG. 1

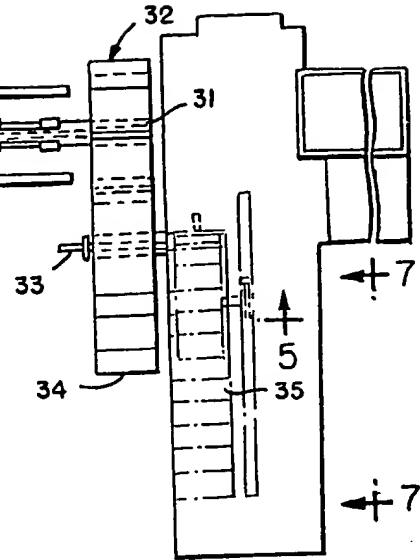
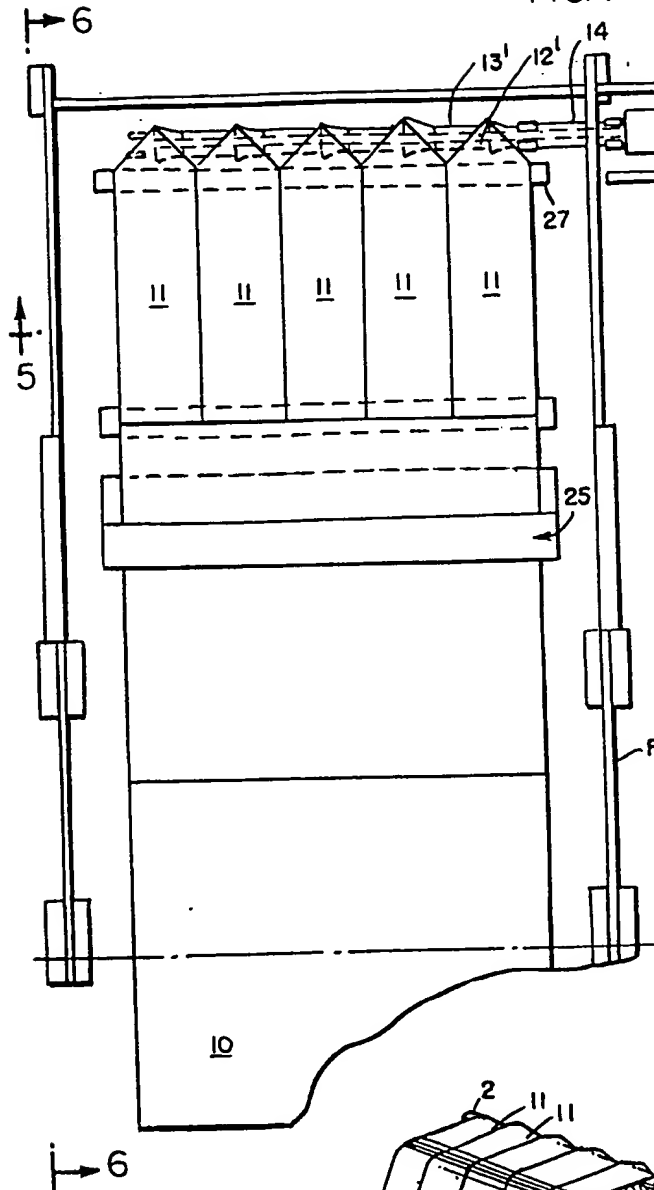


FIG. 3

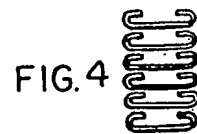


FIG. 4

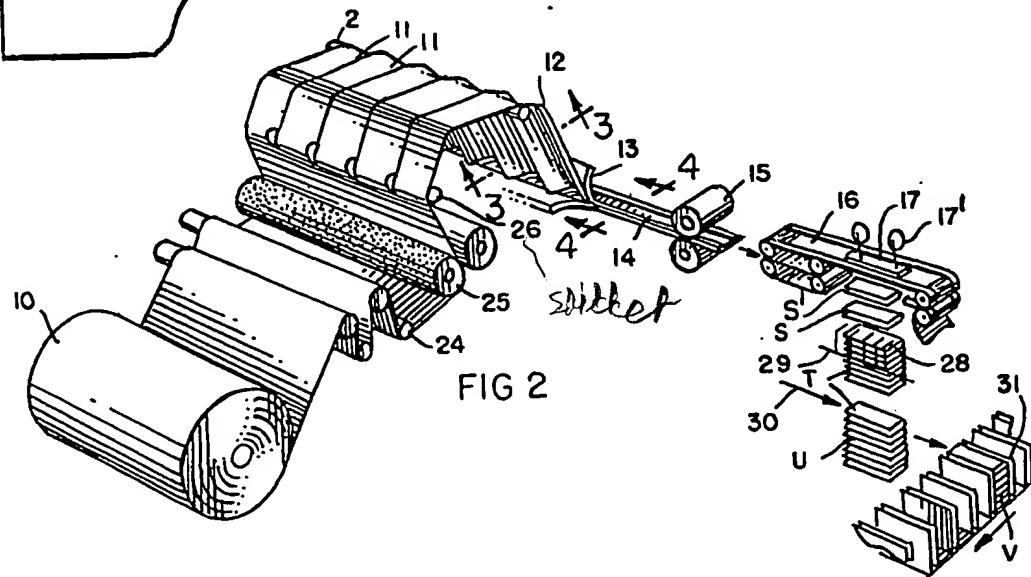


FIG 2

FIG. 5

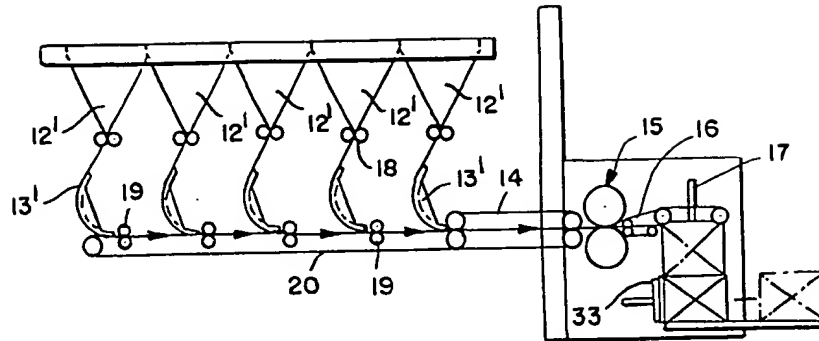


FIG. 6

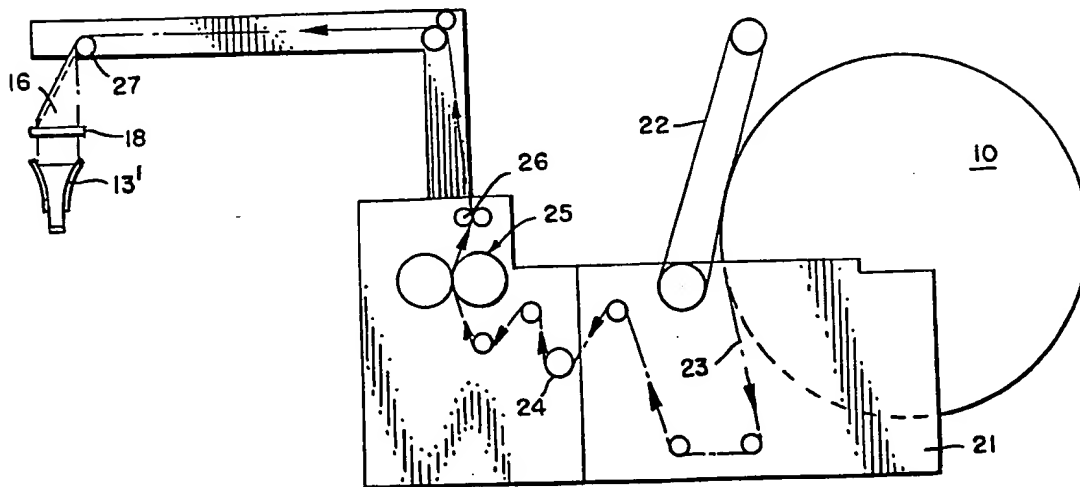
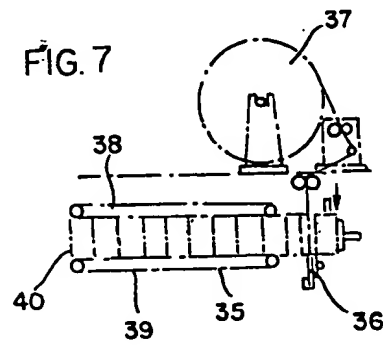


FIG. 7



SPECIFICATION

Method and apparatus for folding web material

5 This invention relates to a method and apparatus for folding web material and, more particularly, to a method and apparatus which is especially suited for web material derived from a parent roll which is slit and thereafter longitudinally folded. Exemplary of the webs suitable for use in the practice of the invention are paper towels.

The paper towels with which the instant invention is concerned normally are derived from base paper which has a ream weight of about 7 to about 50 pounds per 3,000 square feet. More particularly, the stock currently employed commercially in the United States today has a 30 pound per ream basis weight and is normally embossed to increase absorbency and softness.

10 The converting machinery employed to make the C-folded towels normally provides an initial "V" longitudinal fold. For example, the industrial type C-folded towel starts from a web 13-14" wide, folded in half and then C-folded inwardly on both longitudinal edges to a new total width of approximately 3-1/4". The machinery for producing such towels normally is limited to a four-wide parent roll, viz., of the order of 50-65". The parent roll is slit into four discrete webs which are then V and C folded after which they are each transversely slit by pinch cutting rolls and then transferred individually by vacuum drums to individual chutes -- one for each web. The chutes are conveniently provided on a conveyor and remain in a temporary position until a predetermined number of web segments, are accumulated. Normally, 150-300 towels (web segments) are provided for each package.

A number of problems and limitations characterize the prior art method and apparatus. In particular, there was a distinct size limitation because the vacuum rolls or drums were limited for all practical purposes to a four-wide machine. For example, if a vacuum was drawn from one end of the roll the vacuum conduits leading to the opposite side of the roll contained more air. And since imposition of the vacuum was provided intermittently, each vacuum draw was first required to exhaust a certain quantity of air and, for the ports more remote from the point of vacuum draw, there was a time lag in response or a sluggish vacuum response which further limited the speed of operation of the machine. Additionally, the stacks of towels were each accumulated from a precise transverse location in the web so that if the parent paper machine had a caliper variation, one stack of towels would be continually under or over caliper depending upon the characteristic of the parent producing machine.

Another prior art method and apparatus which has been employed for a converted product such as C-folded facial tissues is a continuous stack producer wherein a large plurality of parent rolls are provided so that 200 to 300 longitudinally folded superposed webs can be accumulated and then simultaneously-cut transversely -- as by the apparatus seen in US Patent No. 3,288,009. Such apparatus did not recom-

70 mend itself for toweling because of the inability to emboss individual slit webs, the space requirements being enormous and not suited for towel production, and the machinery itself presented substantial operational difficulties when employed for anything but facial tissue.

Although, in a sense, the instant invention seemingly makes use of elements and techniques present in part in each of the foregoing prior art machines, it is believed that the limitations characteristic of these prior art machines contra-indicated the usage of various parts in a new combination. According to the invention, a multiple width roll of web material is slit to provide a plurality of webs, each web being longitudinally folded in V and C fashion. Thereafter the webs are superposed and transversely pinch cut to provide substacks after which a plurality of substacks are accumulated to provide a final stack of the converted product.

85 The invention is described in conjunction with an illustrative exemplary embodiment in the accompanying diagrammatic drawings, in which:-

Figure 1 is a plan view of apparatus incorporating teachings of the invention;

90 Figure 2 is a fragmentary perspective view of a portion of the apparatus of Figure 1;

Figure 3 is a sectional view through one V-folded web as seen along the line 3-3 applied to Figure 2;

Figure 4 is a sectional view taken along the line 4-4 of Figure 2;

95 Figure 5 is a side elevational view of the apparatus of Figure 1 such as would be seen along the sight line 5-5 applied to Figure 1;

Figure 6 is another elevational view of the apparatus of Figure 1 such as would be seen along the sight line 6-6 of Figure 1; and

100 Figure 7 is yet another elevational view, this being taken along the sight line 7-7 as applied to Figure 1. Referring first to Figure 2, the numeral 10 designates generally a parent roll which is seen to provide a series of slit webs 11 which are V-folded (Figure 3) and C-folded (Figure 4) as at 12 and 13, respectively and then passed into feed belts 14 for transverse cutting as at 15.

110 The elevational view in Figure 5 shows the operation just referred to and in addition, after the cutoff mechanism 15 shows a take-away mechanism 16 (consisting of a pair of spaced belts) and an orbital packer 17. The orbital packer 17 assists in the development of a stack of towels or the like which then is packaged.

115 Still referring to Figure 5, it is seen that in the illustration given there are provided five V-folding plates 12'. Thus, the web from the parent roll is slit into five discrete webs for passage over the five V-folding plates 12'. Here, it should be appreciated that the roll widths may vary, as well as the machine arrangement. For example, two multi-width parent rolls may be mounted in axial alignment as compared with one wider roll.

120 As each web issues from its associated V-folding plate 12', it passes between a pair of creasing rolls 18 and through a C-folding plate 13'. Downstream of each C-folding plate 13' are further compressing rolls 19. The thus folded webs are conveyed on

carrier belts 20 into the feed belt unit 14 and thence to the cutoff roll 15. Thus, the cutoff roll simultaneously pinches through five or six or more longitudinally folded webs to provide a substack of that number. If the ultimate package is to contain 150 towels, 30 substacks of five are accumulated in the orbital packer prior to shifting of the stack into the packaging mechanism.

The overall operation of the method and apparatus of the invention can be first appreciated from a comparison of Figures 1, 2 and 6. There the numeral 10 designates a parent roll mounted on a suitable unwind stand schematically represented at 21 and which is unwound by a belt arrangement 22 to provide a web 23. The web 23 is passed around various idler rolls (un-numbered) and a dancer roll 24 into an embosser generally designated 25. Thereafter, the web passes through a slitter 26, over a turning roll 27 into the V-folding plates 12' and the C-folding plates 13'. As can be readily appreciated from the top left hand portion of Figure 1, the various slit web portions 11 are superposed and conducted by the belt unit 14 into the cutoff roll unit 15.

The orbital packer 17 is reciprocated vertically by means of an eccentric mechanism depicted schematically at 17' in Figure 2. The packer 17 terminates in a plate or tamper at the bottom thereof to push the five web segments (as illustrated in a substack S') onto a previously developed substack S - see Figure 2 - which in turn is supported on a set of count separating fingers 28. More particularly, the fingers 28 are mounted for selective pivotal motion into the substack path about an axis 29. The packer 17 simply displaces the sub-stack S, S', etc. vertically a small amount, the lowest sub-stack S' being placed on the two opposing sets (rear set not shown) of inserted count separating fingers which descend through the position T (representing a complete stack) and place a completed stack U onto a bottom dead plate (now shown) for horizontal movement as at 30 into the conveyor bucket 31, viz., in the position occupied by the stack V. Thus, a considerably greater speed can be developed - for example, with a count of 150, 30 orbits of the packer would represent a completed stack whereas, according to the prior art method, 150 orbits of the packer would be required to develop a completed stack.

The conveyor buckets or chutes 31 are carried by an index conveyor generally designated 32 and which is suitably integrated with the frame F (see Figure 1) or other structure which carries the already mentioned parts.

After the stack V is placed on the index conveyor 32, it is transferred laterally by means of a pusher 33 (see Figures 1 and 5) if it is acceptable, i.e., up to specification. Unacceptable stacks are continued on the index conveyor 32 to a reject station at the end of travel at 34. The suitable stacks are conveyed on a conveyor 35 (see also Figure 7) where they are subjected to a banding operation via a banding mechanism 36. The mechanism 36 derives a banding strip for each stack V from a parent roll 37. After banding the stacks are conveyed by compression belts 38 and 39 to a discharge point 40 for cartoning. From the foregoing, it will be seen that not only

have the drawbacks of prior art manufacture been avoided but further this has been done in an arrangement which is especially space efficient. As can be appreciated from Figure 1, the steps of unreeling, embossing, slitting and V folding are performed when the web (or webs) is or are travelling in a first direction, i.e., along a first path. Then, the steps of C folding, accumulating and transverse severing are all performed along a second path at a right angle to the first path. The packing or tampering occurs in a vertical path of slight distance, i.e., essentially a step in the second path after which stack pushing occurs as at 30 also in line with the second path. Lastly, the stacks are conveyed along a third path parallel to the first path by the conveyor 32. The "good", i.e., acceptable stacks are shifted laterally for movement in a fourth path parallel to the first and third paths while the "rejects" continue in the third path. This makes for a most compact equipment arrangement as well as one wherein the web segments are under positive control at all times so as to achieve high speed, reliable operation.

90 CLAIMS

1. A method for producing stacks of folded web material wherein a multiple width roll of web material is unwound to produce a continuous web and thereafter slit longitudinally to produce a plurality of narrower webs, each narrower web being longitudinally folded and thereafter C-folded, said method further comprising horizontally superposing said plurality of narrower webs and transversely pinch cutting the superposed narrower webs at equally spaced intervals to produce substacks, and vertically accumulating a plurality of said substacks into a stack.

2. The method of claim 1 in which during said accumulating each said substack is vertically tamped.

3. The method of claim 2 in which said superposed narrower webs are advanced horizontally by belt means after pinch cutting, said belt means including spaced apart endless belts flanking means for performing said vertical tamping.

4. The method of any one of the preceding claims in which said multiple width roll has a basis weight of about 7 to about 50 lbs. per 3,000 sq. feet ream providing 3 to 6 said narrower webs per roll.

5. The method of any one of the preceding claims in which said web material is advanced along a first path wherein the steps of unwinding, slitting and longitudinal folding are performed, thereafter the narrower webs are advanced along a second path at 90° to the said first path wherein the steps of C-folding, superposing and pinch cutting are performed, and thereafter along a third path parallel to said first path for selection and banding.

6. Apparatus for producing stacks of folded web material, said apparatus comprising a frame, said frame including means for unwinding a multiple width roll of web material to produce a continuous web, means on said frame for slitting said web longitudinally to produce a plurality of narrower

webs, means on said frame for longitudinally folding each narrower web and thereafter C-folding each narrow web incident to a right angle turn of each narrow web, belt means on said frame for superposing said plurality of webs and advancing the same along a horizontal path, means for transversely pinch cutting the superposed webs at equally spaced intervals to produce substacks while the same are advanced in said path, and tamper means on said frame after said pinch cutting means for vertically accumulating a plurality of substacks into a stack.

7. Apparatus for producing stacks of folded web material, said apparatus being constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in the accompanying diagrammatic drawings.

8. A method for producing stacks of folded web material, said method being substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

9. A stack of folded web material when produced by a method according to any one of Claims 1 to 5 or Claim 8 or by use of apparatus according to Claim 6 or Claim 7.

New claims or amendments to claims filed on 8.11.79.

30 Superseded claims 1-9.

New or amended claims:-

1. A method of producing stacks of cut web material, wherein a multiple width roll of web material is unwound to produce a continuous web and thereafter slit longitudinally to produce a plurality of narrower webs, said method further comprising superimposing said plurality of narrower webs and transversely pinch cutting the superimposed narrower webs at equally spaced intervals to produce substacks, and vertically accumulating a plurality of said substacks into a stack.

2. A method according to Claim 1 in which during said accumulating each said substack is vertically tamped.

3. A method according to Claim 2 in which said superimposed narrower webs are advanced horizontally by belt means after pinch cutting, said belt means including spaced apart endless belt flanking means for performing said vertical tamping.

4. A method according to any one of the preceding claims in which said multiple width roll has a basis weight of about 7 to about 50 lb per 3,000 ft² ream, providing 3 to 6 said narrower webs per roll.

5. A method according to any one of the preceding claims in which before being superimposed the narrower webs are folded.

6. A method according to Claim 5 wherein each narrower web is first longitudinally folded and thereafter C-folded.

7. A method according to any one of Claims 1 to 4 in which said web material is advanced along a first path wherein the steps of unwinding and slitting are performed, thereafter the narrower webs are advanced along a second path at 90° to the said first

path wherein the steps of superimposing and pinch cutting are performed, and thereafter along a third path, parallel to said first path, for selection and banding.

8. A method according to Claim 6 in which said web material is advanced along a first path wherein the steps of unwinding, slitting and longitudinal folding are performed, thereafter the narrower webs are advanced along a second path at 90° to the said first path wherein the steps of C-folding, superimposing and pinch cutting are performed, and thereafter along a third path, parallel to the said first path, for selection and banding.

9. An apparatus for producing stacks of cut web material, said apparatus comprising a frame, said frame including means for unwinding a multiple width roll of web material to produce a continuous web, means on said frame for slitting said web longitudinally to produce a plurality of narrower webs, means on said frame for a right angle turn of each narrower web, belt means on said frame for superimposing said plurality of webs and advancing the same along a horizontal path, means for transversely pinch cutting the superimposed webs at equally spaced intervals to produce substacks while the same are advancing said path, and tamper means on said frame situated downstream of said pinch cutting means for vertically accumulating a plurality of substacks into a stack.

10. An apparatus according to Claim 9 including means, situated upstream of the belt means, for folding each narrower web.

11. An apparatus according to Claim 10 wherein the folding means include means for longitudinally folding each narrower web and thereafter C-folding each narrower web incident to the right angle turn thereof.

12. An apparatus for producing stacks of cut web material, said apparatus being constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in, the accompanying diagrammatic drawings.

13. A method for producing stacks of cut web material, said method being substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

14. A stack of cut web material when produced by a method according to any one of Claims 1 to 8 or Claim 13 or by use of apparatus according to any one of Claims 9 to 12.